

# Work Order ID 71753

Monday, July 11, 2011 10:39:02 AM

Page 1

Item ID: D407-667-105

Accept

Setup Start

Revision ID: U/R

Stop

Item Name: Crosstube Fwd

Start Date: 7/11/2011 Start Qty: 1.00

Cust Item ID:

Required Date: 7/28/2011 Req'd Qty: 1.00

Customer:

Reference:

Approvals: Process Plan:                      Date: 11-07-11

Tooling:                      Date:                     

Run Start

QC:                      Date:                     

SPC (Y/N):                      Date:                     

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D407-667-145	Rev C U/R

11.615  
OK CP 11.07.12

100	DOCUMENT CONTROL	0.00
DC	Memo	0.00
Document Control	Photocopy bluefile and create labels as per PPP D407-667-105	CHG003

After CL 11.9-2

CHG 004

SEE ATTACHED

8/10/12

110	Packaging	0.00
Packaging	Memo	0.00
Packaging		

JW 11-08-02

120	BENDING MACHINE - CROSSTUBES	0.00
CNC Bend 2	Memo	0.00
CNC Alpha 160 Bender	Bend tube as per Dwg D407-667-145 using CNC bender program 407-fw	

JW 11-08-02

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 71753**

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Page 2

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Start Date: 7/11/2011 Start Qty: 1.00



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Required Date: 7/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals:

Process Plan: \_\_\_\_\_

Date: \_\_\_\_\_

Tooling: \_\_\_\_\_

Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_

Date: \_\_\_\_\_

SPC (Y/N): \_\_\_\_\_

Date: \_\_\_\_\_

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

130

QC15- Crosstube Dimensional Check

0.00



QC

Memo

0.00

8 wbs/oz

(40)

Quality Control

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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Page 3

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Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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140



Crosstubes

Crosstubes

0.00

0.00

①

Crosstubes

Memo

1- scribe batch # inside of cuff

2-Drill pilot holes in tube using drill Jig DT8541 & DT8542 as per Dwg D407-667-145. Drill all (3) top holes use drill table jig DT8577 hole #1,#11 to set up towers, as per QSI0010.

3-Drill and Ream all holes in tube to finish size using drill Jig DT8541 & DT8542 as per Dwg D407-667-145 Check dimensions between holes on all four sides.

4-Flip tube and switch drilling Jigs from right to left, left to right. Locate Jigs off existing holes using "T" pins.

5-Drill pilot holes using drill Jig DT8541 & DT8542 as per Dwg 407-667-145. Drill only the top (2) holes.

6-Drill & ream the top (2) holes to finish size using drill Jig DT8541 & DT8542 as per Dwg D407-667-145

7-Drill Fwd rivet holes using drill Jig DT8787FWD as per Dwg D206-667-145. Note: Fwd side has 3x top holes.

8-Drill Aft rivet holes using drill Jig DT8787AFT as per Dwg D407-667-145.

9-C'sink holes as per Dwg D407-667-145. Allow rivet to sit below surface to compensate for paint.

10 -Deburr & Inspect for surface damage. Repair damage within limits as per

SAD  
11-08-03

3  
JTW

11-08-03

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
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Page 4

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Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



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Dwg D407-667-145

150

Crosstubes Chemical Conversion

0.00

SAD 11-08-03



HandFXtube

Memo

0.00



Hand Finishing Crosstubes

160

QC3- Inspect Part Finish

0.00



QC

Memo

0.00

Quality Control

Sullos/04

170

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

Sullos/04



W/O:		WORK ORDER CHANGES					
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Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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[illegible]

Monday, July 11, 2011 10:39:02 AM

**Accept**

[illegible]**Setup Start**

**Stop**

[illegible]**Cust Item ID:**

**Author's address:**

**Customer:**

**Reference:**

Run Start

**Approvals:**      **Process Plan:** \_\_\_\_\_ **Date:** \_\_\_\_\_ **Tooling:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Stop**

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

[illegible][illegible][illegible]

Outsource2

### Outsource process - NDT

Operation	Description
Outsource process - NDT per QSI038 4.1	

0.00

## Memo

0.00

OUTSIDE SERVICE -CROSSTUBES  
Liquid Penetrant Inspection as per QSI 038 Or  
Issue P/O: 14639 LPI as per ASTM 1417  
Level 2 Attach copy of NDT results to work order

PO: 14697

~~RP1108-5~~ Pro →  
CL1108/17(1)

0.00

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### Packaging

## Packaging

## Packaging

0.00

## Memo

Inspect for transit damage  
Ensure copy of NDT results attached to work order.

~~PL11/5/E ①~~  
CX11/08117 ①

0.00

[illegible]

QC

### Quality Control

QC5- Inspect part completeness to step on W/O

0.00






## Memo

Inspect for damage & ensure results are as per Dwg D206-667-145

25 11-02-17

W/O: 71753		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D407-667-105 PAR #: N/A Fault Category: landing gear cross tube NCR: (Yes) No DQA: A Date: 11.09.08  
 Resolution: rework Disposition: re work QA: N/C Closed Date: 11/09/08

NCR: <del>71753</del>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
11/08/05	# 10	too many marks found at NDT inspection R.L. Process		→ re-grind entire tube → re-align AS per DS2005	 11-08-08	 11/09/08		 11/08/05

NOTE: Date &amp; initial all entries

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Monday, July 11, 2011 10:39:02 AM



Page 6

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Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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210

0.00



SprayPaint

SprayPaint

Memo

0.00

Spray Painting

1-Prime inside and outside crosstube as per QSI 005 4.2

2-Paint outside crosstube with White Imron as per QSI 005 4.2

PRIME:

Start Time: 1000

Finish Time: 1100

PAINT:

Start Time: 300

Finish Time: 400

85 11-08-21

220

0.00



QC14- Inspect Spray Paint

QC

Memo

0.00

Quality Control

Then, Wrap in plastic bag to protect from scratches

11 11-08-22 ①

W/O:		WORK ORDER CHANGES					
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Page 7

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230

0.00



Crosstubes

Crosstubes

Memo

0.00

1-Install support using 0.03" to 0.06" thick layer of magnobond 6398 per QSI 015. Let cure for 12h after installation and prior to packaging. Note: (3) top holes should be facing up.  
A/R Magnobond 6398 : 118234

★ USE PRO SEAL  
SEE ATTACHED

11-08-31 ①

2-Torque clamps to 80-100 in lb

3-Install nut plates as per Dwg D407-667-145. Touch-up rivet heads with Imron paint.

240

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Sulorlo

CF

Quality Control

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W/O: 71753

## WORK ORDER CHANGES

DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector
11.07.12	230	BOND SUPPORTS USING PROSEAL PER ATTACHED PROCEDURE (EMAIL) NOW @ CHG 004	<i>[Signature]</i>	11-08-29	1	<i>[Signature]</i> 11.07.12 057042	<i>[Signature]</i> 11/08/06

Part No: D407-667-105 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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NOTE: Date &amp; initial all entries

## Chris Provencal

**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Wednesday, June 15, 2011 3:05 PM  
**To:** 'Chris Provencal'  
**Cc:** 'Mike Petsche'; 'Dan Stow'; 'Eric Downing'; 'Linda Lacelle'  
**Subject:** RE: Procedure for installing supports.

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi Chris,

I agree with your procedure outlined below. It is our preference to leave the paint on the crosstube if we can for added corrosion protection (and for ease of manufacture). If Dan's final testing shows there is a big difference between a painted/unpainted crosstube, then we will switch to alodine only on the crosstube.

David

---

**From:** Chris Provencal [mailto:cprovencal@dartaero.com]  
**Sent:** Wednesday, June 15, 2011 11:24 AM  
**To:** 'David Shepherd'  
**Cc:** 'Mike Petsche'; 'Dan Stow'; 'Eric Downing'  
**Subject:** RE: Procedure for installing supports.

David,

Can I confirm that this is the agreed procedure for all newly manufactured tubes with off-center supports:

- Scuff paint under support, clean with MEK
- Completely remove any finish on support (if present), scuff bottom surface of support, clean with MEK
- Apply a 0.04" – 0.07" layer of Proseal 890 class B-2 on bottom of support and install wet.
- Install clamps and torque per dwg
- Clean up excess proseal
- Let cure for 72 hours after installation, recheck torque.

Chris

---

**From:** David Shepherd [mailto:dshepherd@dartaero.com]  
**Sent:** Tuesday, June 14, 2011 10:59 AM  
**To:** 'Chris Provencal'  
**Cc:** 'Mike Petsche'; 'Dan Stow'; 'Eric Downing'  
**Subject:** RE: Procedure for installing supports.

Made a couple of small changes.

- Remove finish on xtube in area of support down to alodine finish.
- Touch up alodine on xtube in affected area
- Completely remove any finish on support, scuff bottom surface of support
- Apply a 0.04" – 0.07" layer of Proseal 890 class B-2 on bottom of support and install wet.
- Install clamps and torque per dwg





**Work Order ID 71753**

Monday, July 11, 2011 10:39:02 AM



Page 8

Item ID: D407-667-105

Accept



Setup Start



Revision ID: U/R

Stop



Item Name: Crosstube Fwd

Start Date: 7/11/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 7/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
250  Packaging Packaging	Pick Kit  Memo	0.00  0.00						11-09-01	
260  QC Quality Control	QC4- 100% Inspect kits for completeness  Memo	0.00  0.00							
270  Packaging Packaging Packaging	Packaging  Memo Identify and pack for shipping as per PPP D407-667-105 Location: _____ PPP Rev:	0.00  0.00							

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 71753**

Monday, July 11, 2011 10:39:02 AM



Page 9

Item ID: D407-667-105

Accept



Setup Start



Revision ID: U/R

Stop



Item Name: Crosstube Fwd

Start Date: 7/11/2011 Start Qty: 1.00



Cust Item ID:

Required Date: 7/28/2011 Req'd Qty: 1.00



Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run Hours

Tool ID

Tool #

Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

280

QC21- Final Inspection - Work Order Release

0.00



QC

Memo

0.00

Quality Control

11/9/11

ME 11-09-02

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Monday, July 11, 2011 10:37:26 AM

Page 1

Work Order ID: 71753

Parent Item: D407-667-105

Parent Item Name: Crosstube Fwd





Start Date: 7/11/2011

Required Date: 7/28/2011

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:F 05.09.01 Add holes for compatibility with Bell Skidtubes KJ/JLM  
 IPP Rev:G 08-05-16 chg QC6 to QC15 DD verified by:EC  
 IPP Rev:H 08-06-03 update as per DSI9415 (ECN1198) DD verified by:ec  
 IPP Rev:I 08-07-14 add (scribe inside of tube) seq.6 DD verified by:EC  
 IPP Rev:J 08-07-28 update as per (par 08-013) DD verified by:EC  
 IPP Rev K 09.01.06 ECN 08-562 EC verified by:DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D407-667-105TRN 		Manufactured	No			110	Each	0.0000	1				
Crosstube Turning Detail													
D2873-043 		Manufactured	No			230	Each	8.0000	2				
Nut Plate Assembly													
<div style="display: flex; justify-content: space-between;"> <div>#72248</div> <div>Location</div> <div>Loc Qty</div> <div>Loc Code</div> </div>													
				LG			8						
				68801			8						
D2873-045 		Manufactured	No			230	Each	3.0000	2				
Nut Plate Assembly													
<div style="display: flex; justify-content: space-between;"> <div>#71983</div> <div>Location</div> <div>Loc Qty</div> <div>Loc Code</div> </div>													
				LG			2						
				68800			2						
				LG052			1						
				65992			1						
D2891-1 		Manufactured	No			230	Each	17.0000	2				
2.25 Support													
<div style="display: flex; justify-content: space-between;"> <div>#71991</div> <div>Location</div> <div>Loc Qty</div> <div>Loc Code</div> </div>													
				LG052			17						
				70734			17						

11-8-2  
11-08-31

11-08-31

11-08-29

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Monday, July 11, 2011 10:37:26 AM

Page 2

Work Order ID: 71753

Parent Item: D407-667-105

Parent Item Name: Crosstube Fwd

Start Date: 7/11/2011

Required Date: 7/28/2011

Start Qty: 1.00

Required Qty: 1.00

D3595-063-395

Manufactured No

230 Each

133.0000

4 4



RUBBER CUSHION



W 11.08.29

Location

Loc Qty

Loc Code

LG

132

70975

132

LG055

1

63368

1

MS20601-AD4W10

Purchased No

230 Each

75.0000

14 14



RIVET



W 11.08.31

Location

Loc Qty

Loc Code

LG051

75

116186

3

117676

72

MS21920-20

Purchased No

230 Each

94.0000

4 4



Clamp (per MIL-DTL-8783C)



W 11.08.29

Location

Loc Qty

Loc Code

LG050

94

116799

10

117279

30

117968

4

118236

50

Monday, July 11, 2011 10:37:26 AM

Shop Packet Print

Page 2



W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Monday, July 11, 2011 10:37:26 AM

Page 3

Work Order ID: 71753

Parent Item: D407-667-105

Parent Item Name: Crosstube Fwd

Start Date: 7/11/2011

Required Date: 7/28/2011

Start Qty: 1.00

Required Qty: 1.00

AN5-10A  
Bolt

Purchased

No

250

Each

312.0000

10 10



SP 11-09-01

Location	Loc Qty
ST337	312
116704	16
117795	125
117872	99
118191	72

Loc Code

AN5-30A  
BOLT

Purchased

No

250

Each

76.0000

4 4



SP 11-09-01

Location	Loc Qty
ST339	76
116003	2
117514	49
118191	25

Loc Code

AN5-32A  
Bolt

Purchased

No

250

Each

214.0000

4 4



SP 11-09-01

Location	Loc Qty
ST340	214
117161	29
117514	50
117688	25
117872	60
118191	50

Loc Code

AN960JD516  
Washer

NAS1149D0563J

Purchased

No

250

Each

0.0000

18 18



SP 11-09-01

m 118206 18x

Monday, July 11, 2011 10:37:26 AM

Shop Packet Print

Page 3

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Monday, July 11, 2011 10:37:26 AM

Page 4

Work Order ID: 71753

Parent Item: D407-667-105

Parent Item Name: Crosstube Fwd



Start Date: 7/11/2011

Required Date: 7/28/2011

Start Qty: 1.00

Required Qty: 1.00

MS21042LS1

Purchased

No

250

Each

1,437.000

4 / 4



Nut



SP 11-09-01

Location

Loc Qty

Loc Code

ST300

1437

115594

24

116105

5

116548

220

117441

498

117591

100

117611

94

118179

496

4+

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

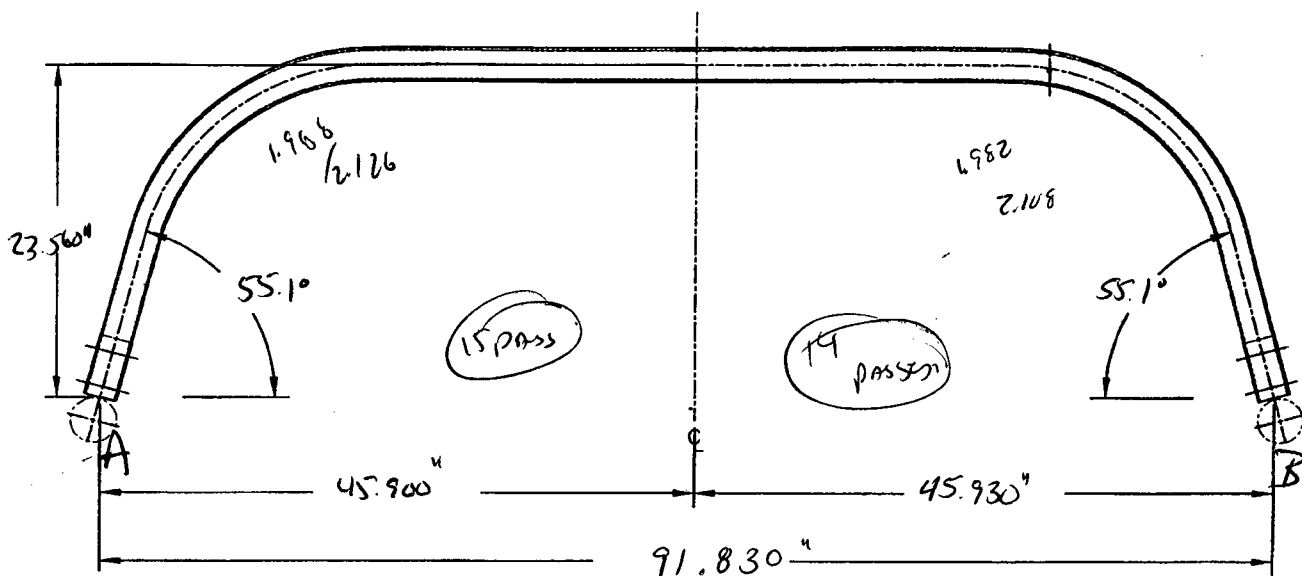
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b>	11253
<b>Description: Crosstube High Fwd (407)</b>	<b>Part Number:</b>	D407-667-105
<b>Inspection Dwg: D407-667-145</b>	<b>Rev: C</b>	<b>Page 1 of 1</b>

Required Dimension	Min	Max
Height	23.41	23.67
1/2 Span	45.81	46.07
Angle	54	56
Total Span	91.63	92.13



Comments	
Side A = 3.3%	15 Passes on Side A
Side B = 3.0%	14 Passes on Side B

QC15 Inspection	8
Date	11/02/12

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	09.11.12	Dimensions updated per Dwg Rev C	KJ	

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

D407-667-105 71753 ECN 11-615

Item	Qty -145	Part Number	Description
1	X	D407-667-145	CROSSTUBE ASSEMBLY (407 HIGH FWD)
2	1	D6010-115	CROSSTUBE
3	2	D2873-043	NUT PLATE
4	2	D2873-045	NUT PLATE
5	2	D2891-1	SUPPORT
6	4	D3595-063-395	RUBBER CUSHION
7	4	MS21920-20	CLAMP (OR MS21920-21)
8	14	MS20601AD4W10	RIVET (OR NAS9302B-4-10)
9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

# GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6010-115  
FINISHED LENGTH = 113.20±0.020
- FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: SCRIBE DART PART NUMBER "D407-667-145" AND BATCH NUMBER ON INSIDE OF CUFF USING VIBRATING STYLUS.
- WEIGHT: 17.8 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE.
- RUN CUTTER OFF PART WHERE INDICATED. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- BEND PROGRESSIVELY WITH A MINIMUM OF 6 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- INSTALL D2891-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- INSTALL MS21920-20 CLAMPS (OR -21) WITH D3595-063-395 RUBBER CUSHIONS TO SECURE THE D2891-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMP MECHANISMS ARE LOCATED ON CROSSTUBE SUPPORTS.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS ARE SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

DEO ATTACHED

ECN #11-615  
11.07.26

UNDER REVIEW

RELEASED  
05/11/12

C	REVISE GENERAL NOTES/PART LIST (ZN D7-1); REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS. D3595-063-395 WAS D2856-400-694 (ZN D6-2 & A5-2); REMOVED REF. 7 ADD TOLERANCES (ZN C6-3, C4-5, D2-3); RELOCATED FLAG #6 (ZN A8-3) PER NCR 210; MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	08.11.06
B	ADD HOLES AND NUT PLATES FOR COMPATABILITY WITH BHT/AA SKUDTUBES	PH	05.07.26
A	NEW ISSUE	CP	02.05.08
REV.	DESCRIPTION	BY	DATE
DESIGN	RF	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	RF	DRAWING NO.	REV. C
MFG. APPR.	RF	D407-667-145	SHEET 1 OF 4
APPROVED	RF	TITLE	SCALE
DE APPR.	RF	CROSSTUBE ASS'Y (407 HIGH FWD)	NTS
DATE	08.11.06	COPYRIGHT © 2002 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSES OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	



8 7 6 5 4 3 2 1

- 12 D2891-1 SUPPORT  
2 PL
- 15 MS21920-20 CLAMP  
4 PL
- 13 D3595-063-395  
RUBBER CUSHION  
4 PL, (UNDER CLAMP)

13.08

D407-667-505

C

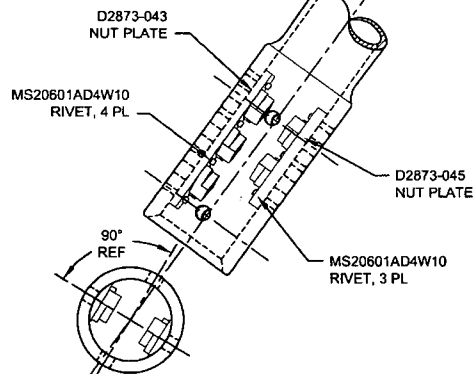
D407-667-145  
ASSEMBLY DETAIL  
(VIEW LOOKING FWD)

ECN #11.615  
11.07.26

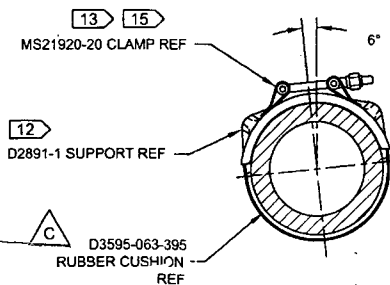
UNDER REVIEW

RELEASE  
08/11/12

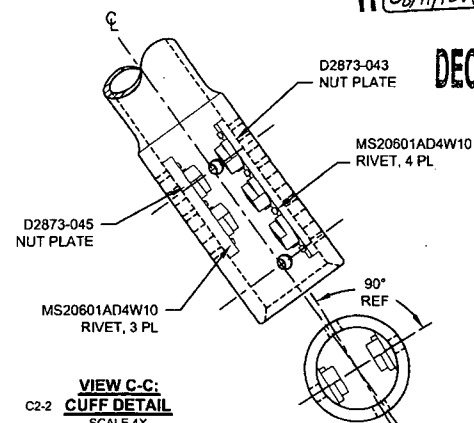
DEO ATTACHED



VIEW A-A:  
CUFF DETAIL  
SCALE 4X

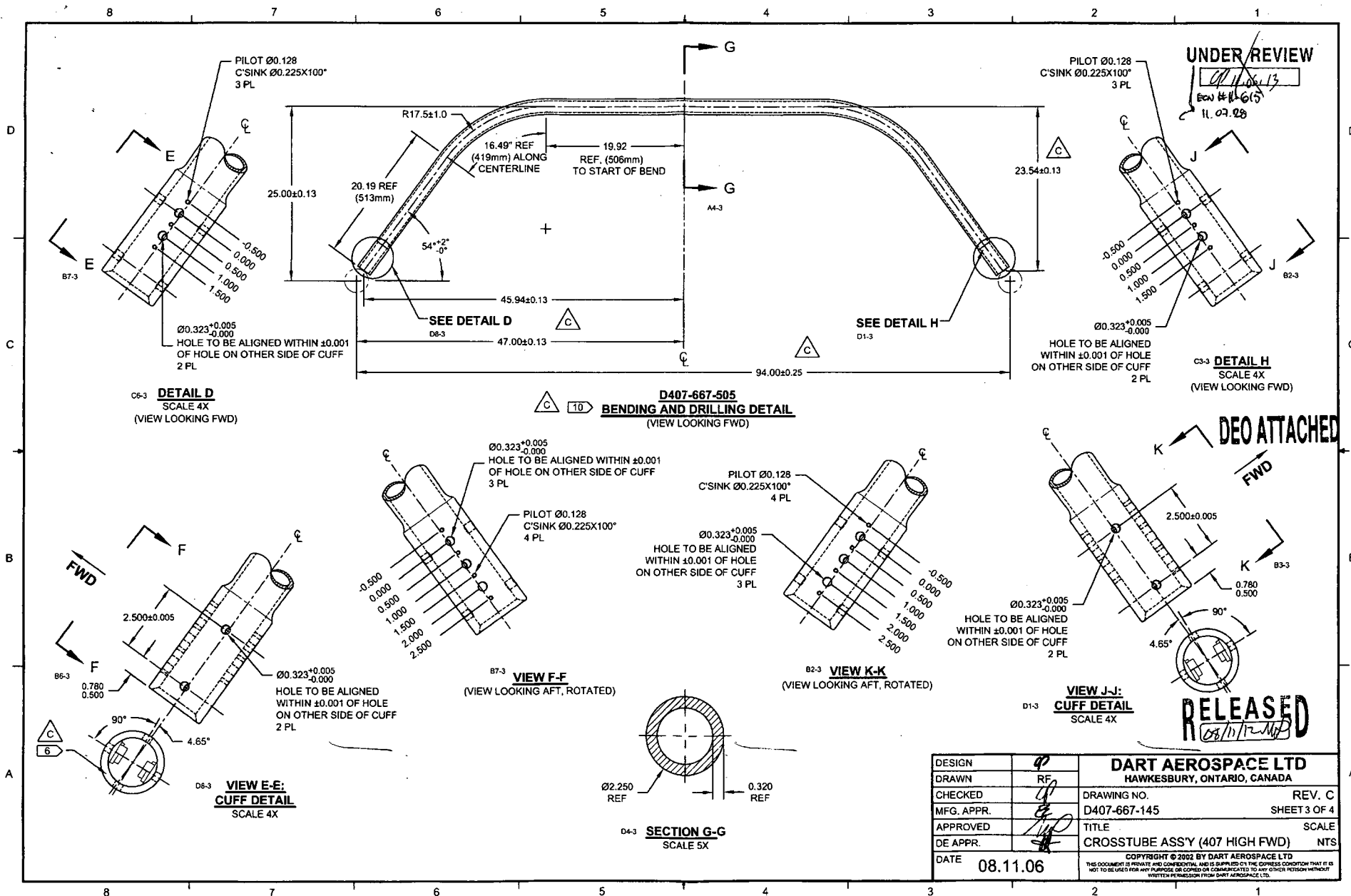


SECTION B-B  
SCALE 5X



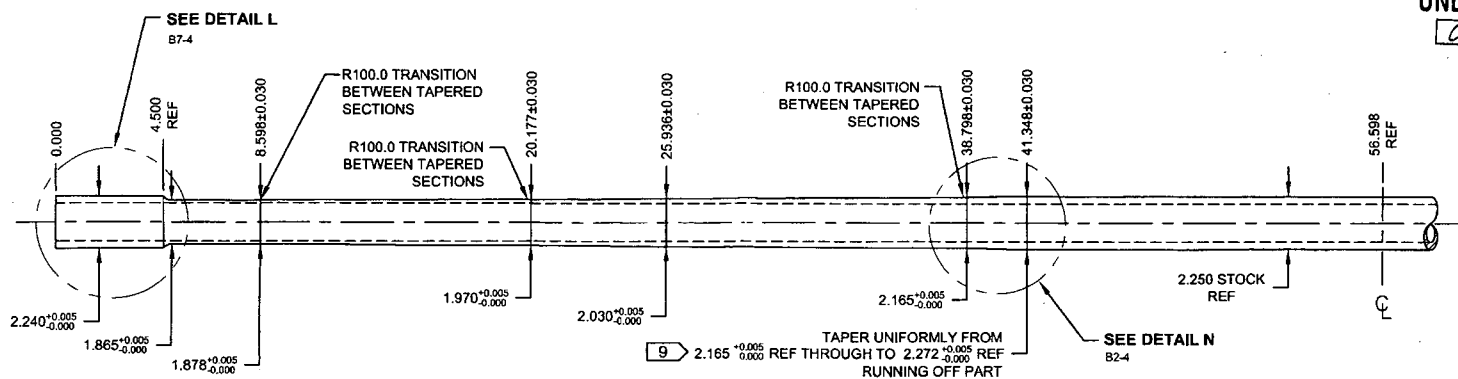
VIEW C-C:  
CUFF DETAIL  
SCALE 4X

DESIGN	RF	DART AEROSPACE LTD	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	RF	DRAWING NO.	REV. C
MFG. APPR.	RF	D407-667-145	SHEET 2 OF 4
APPROVED	RF	TITLE	SCALE
DE APPR.	RF	CROSSTUBE ASSY (407 HIGH FWD)	NTS
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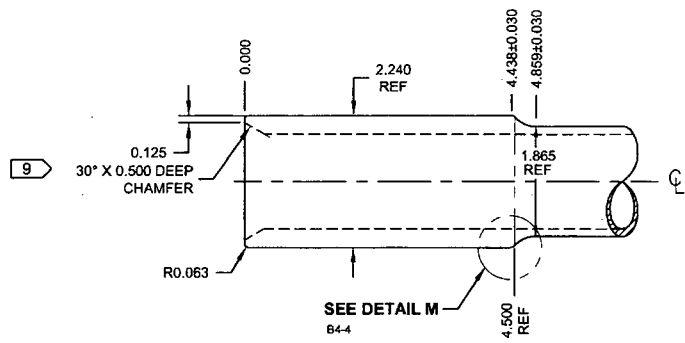


**UNDER REVIEW**

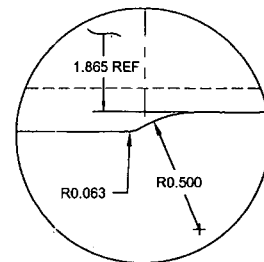
CP 11.06.13  
BWA H/L 615  
11.07.26



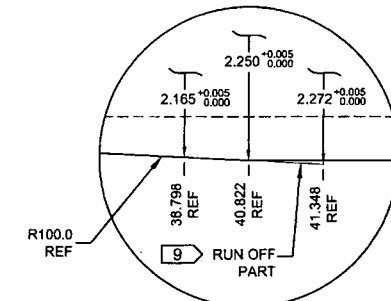
**C TURNING DETAIL**



**DETAIL L:**  
D7-4 **CROSSTUBE CUFF**  
NOT TO SCALE



**DETAIL M:**  
B6-4 **CUFF TRANSITION**  
NOT TO SCALE



**DETAIL N:**  
C3-4 **TAPER RUN-OFF**  
NOT TO SCALE

**DEO ATTACHED**

**RELEASED**  
08/11/13

DESIGN	9	<b>DART AEROSPACE LTD</b>	
DRAWN	RF	HAWKESBURY, ONTARIO, CANADA	
CHECKED	CP	DRAWING NO.	REV. C
MFG. APPR.	CP	D407-667-145	SHEET 4 OF 4
APPROVED	CP	TITLE	SCALE
DE APPR.	CP	CROSSTUBE ASSY (407 HIGH FWD)	NTS
DATE	08.11.06	COPYRIGHT © 2002 BY DART AEROSPACE LTD	
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DRAWING NO. D407-667-145	TITLE CROSSTUBE ASS'Y (407 HIGH FWD)	REV. C	<b>DART AEROSPACE LTD ENGINEERING ORDER</b>		D.E.O. NO. D407-667-145-C-1	SHEET NO. SHEET 1 OF 1	SCALE NTS
DRAWN <i>q</i>	CHECKED <i>ASS</i>	MFG. APPR. <i>KB</i>	APPROVED <i>WD</i>	DE APPR. <i>##</i>			
DATE 11.07.15	DATE 11.07.22	DATE 11.07.22	DATE 11/07/22	DATE 11.07.21			

**PURPOSE:**

REPLACE MAGNOBOND WITH PROSEAL.

**CHANGE:**

IS:

Item	Qty -145	Part Number	Description
9	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

WAS:

9	A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)
---	-----	----------------	---

NOTE 12 & 15, SHEET 1 IS AMENDED AS FOLLOWS:

IS:

- 12) TO INSTALL D2891-1 SUPPORT: ABRASE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.04" TO 0.07" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- 15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. **PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.**

WAS:

- 12) INSTALL D2891-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 15) TORQUE CLAMPS 80 TO 100 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.

**RELEASED**  
2011-07-28  
*WD*

## 5.0 PARTS LIST

## 5.1 HIGH GEAR CROSSTUBES

Item	Qty -101	Qty -201	Qty -103	Qty -203	Qty -105	Qty -205	Part Number	Description
	X						D206-667-101	CROSSTUBE INSTALLATION, 206A/B HIGH FWD
		X					D206-667-201	CROSSTUBE INSTALLATION, 206A/B HIGH AFT
			X				D206-667-103	CROSSTUBE INSTALLATION, 206L/L-1/L-3/L-4 HIGH FWD
				X			D206-667-203	CROSSTUBE INSTALLATION, 206L/L-1/L-3/L-4 HIGH AFT
					X		D407-667-105	CROSSTUBE INSTALLATION, 407 HIGH FWD
						X	D407-667-205	CROSSTUBE INSTALLATION, 407 HIGH AFT
1	1						D206-667-141	CROSSTUBE ASSEMBLY, 206A/B HIGH FWD
2		1					D206-667-241	CROSSTUBE ASSEMBLY, 206A/B HIGH AFT
3			1				D206-667-143	CROSSTUBE ASSEMBLY, 206L/L-1/L-3/L-4 HIGH FWD
4				1			D206-667-243	CROSSTUBE ASSEMBLY, 206L/L-1/L-3/L-4 HIGH AFT
5					1		D407-667-145	CROSSTUBE ASSEMBLY, 407 HIGH FWD
6						1	D407-667-245	CROSSTUBE ASSEMBLY, 407 HIGH AFT
10	*2	*2	*2		*2		D2891-1	SUPPORT
11				*2			D2892-1	SUPPORT
12						*1	D2894-1	SUPPORT
13	*4	*4	*4		*4		D3595-063-395	RUBBER CUSHION
14				*4			D3595-063-450	RUBBER CUSHION
15						*2	D3595-075-430	RUBBER CUSHION
16	*4	*4	*4		*4		MS21920-20	CLAMP
17				*4		*4	MS21920-22	CLAMP
18						*2	MS21920-25	CLAMP (OR MS21920-24)
19	4	4	4		4		AN5-32A	BOLT
20				4		4	AN5-34A	BOLT
21	4	4	4	4	4	4	MS21042L5	NUT (OR MS21042-5)
22	8	8	8	8	8	8	NAS1149C0563J	WASHER (OR AN960JD516)
23						*2	D3190-1	CHAFING SHIELD
40	*2		*2	*2	*2	*2	D2873-043	NUT PLATE
41	*2		*2	*2	*2	*2	D2873-045	NUT PLATE
42		2					D2872-043	NUT PLATE
43		2					D2872-045	NUT PLATE
44	10		10				AN5-7A	BOLT
45		10		10	10	10	AN5-10A	BOLT
46	4	10	4		4		AN5-30A	BOLT
47				4		4	AN5-32A	BOLT
48			12				AN970-4	WASHER (OPTIONAL)
49		6					MS21042L5	NUT (OR MS21042-5)
50	10	12	10	10	10	10	NAS1149C0563J	WASHER (OR AN960JD516)
60		1					D3039-3	CENTER DRILL (TOOLING, NOT INSTALLED)

\*REFERENCE ONLY. PARTS ARE INCLUDED IN D206-667-141/-143/-241/-243 & D407-667-145/-245  
ASSEMBLIES ABOVE



# LIQUID PENETRANT TEST REPORT

P-12239

CLIENT  
ATTENTION  
ADDRESS  
PROJECT  
ITEM(S) EXAMINED

DART Aerospace  
LINDA LACELLE  
1770 ABERDEEN ST.  
HANKSBURY ON.

DATE  
ACUREN JOB NO.  
PO/NO NO.  
WORK LOCATION  
ACCEPTANCE STD.

Aug 15 2011 TIME AM 188-11-02734  
14639  
SAME  
ASTM 1417/031-038 REV./DATE 2005

JOB DESCRIPTION

PROCEDURE NO. LT-002 REV./DATE 2003

TECHNIQUE NO. LT-002 REV./DATE 2003

PART NO.

SCOPE

MATERIAL Aluminum THICKNESS

As follows - X-TUBES  
WET FLUORESCENT LIQUID PENETRANT INSPECTION  
CONDUCTED ON 100% EXTERNAL SURFACE.

TEST DETAILS

METHOD ☒ FLUORESCENT ☐ VISIBLE  
FAMILY BRAND USA FLUX  
PENETRANT 2-67 MINIMUM DWELL TIME 45 MIN.  
PENETRANT REMOVER H2O MINIMUM DRY TIME >10 MIN.  
DEVELOPER SAD 52 MINIMUM DWELL TIME 10 MIN.  
DEVELOPER TYPE ☐ NON AQUEOUS ☒ AQUEOUS ☐ DRY

☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
BLACK LIGHT S/N 16459 ☐ OUTPUT > 1000  $\mu$  W/cm<sup>2</sup> ☐ AMBIENT < 2 fc  
LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
OTHER LAB. NO  
LIGHT METER S/N 1098866 CAL DUE DATE 4-10-12  
2012

TEST SURFACE

SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☐ CLEAN BARE METAL  
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/ 50°F ☐ 10°C/ 50°F TO 52°C/ 125°F ☐ > 52°C/ 125°F

RESULTS-

(☐ METRIC ☐ IMPERIAL)

2 CROSS TUBE, W.O. 71753  
1 CROSS TUBE, W.O. 70732  
4 CROSS TUBE, W.O. 72495  
1 CROSS TUBE, W.O. 72494  
1 CROSS TUBE, W.O. 71752

X INDICATORS TO BE REMOVED & RETESTED.

RT 11-08-13

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a test data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, express or implied, is made or intended by Acuren Group Inc.

SIGNATURES

CLIENT REPRESENTATIVE

TECHNICIAN (SIGNATURE):

NAME (PRINT):

Ken Tiller

Mike Johnson

CGSB LEVEL II SNT LEVEL II  
CGSB REG. NO. 66006

SIGNATURE

2<sup>ND</sup> TECHNICIAN

CGSB LEVEL II SNT LEVEL II  
CGSB REG. NO. 66006

DTR # E63186

REPORT  
REVIEWED BY:

NAME

INITIA

WHITE - CLIENT COPY

CANARY - OFFICE COPY

PINK - TECHNICIAN COPY

GOLD - OFFICE COPY

PTS



ACUREN

## LIQUID PENETRANT TEST REPORT

P- 05100

CLIENT: DART AEROSPACE DATE: August 17<sup>th</sup> 2011 PAGE 1 OF 1  
 ATTENTION: LINDA LACELL ACUREN JOB NO. 158-11-02343 TIME: AM ☒ PM ☐  
 ADDRESS: 1270 ABERDEEN RD PO/VO NO. 14897 WORK LOCATION: Shop  
HAWKESBURY, ONT ACCEPTANCE STD. ASTM 1417/OSI-038 REV./DATE: 2005  
 PROJECT: PT WET FLUORESCENT ON 8 CROSSTUBES  
 ITEM(S) EXAMINED: 8 CROSSTUBES AS LISTED BELOW

OB DESCRIPTION: PROCEDURE NO. LT-002 REV./DATE: 2008 TECHNIQUE NO. LT-002 REV./DATE: 2008  
 PART NO. LISTED BELOW MATERIAL: ALODINE ALUMINUM THICKNESS: \_\_\_\_\_  
 SCOPE: PERFORMED A WET FLUORESCENT L.P.T. ON 100% OF THE EXTERNAL SURFACE ON ALL ITEMS LISTED BELOW

## TEST DETAILS

METHOD: ☒ FLUORESCENT ☐ VISIBLE ☒ WATER WASH ☐ SOLVENT REMOVABLE ☐ POST EMULSIFIED  
 AMILY BRAND: ALODINE BLACK LIGHT S/N: 13778 ☐ OUTPUT > 1000  $\mu$ W/CM<sup>2</sup> ☐ AMBIENT < 2 fc  
 PENETRANT: ZL-67 MINIMUM DWELL TIME: 30 MIN. LIGHTING EQUIP. ☐ FLASHLIGHT ☐ TROUBLELIGHT ☐ OUTPUT > 100 fc @ SURFACE  
 PENETRANT REMOVER: H<sub>2</sub>O MINIMUM DRY TIME: >10 MIN. OTHER: \_\_\_\_\_  
 DEVELOPER: SKD 32 MINIMUM DWELL TIME: 10 MIN. LIGHT METER S/N: N/A CAL DUE DATE: Aug/30/2011  
 DEVELOPER TYPE: ☐ NON AQUEOUS ☒ AQUEOUS ☐ DRY

## TEST SURFACE

SURFACE CONDITION: ☐ AS GROUND ☐ AS WELDED ☐ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL  
 SURFACE TEMPERATURE: ☐ < - 4°C/ 20°F ☐ - 4°C/ 20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS- ( ☐ METRIC ☐ IMPERIAL )

1	W.O.	71753	✓
2	W.O.	71749	✓
3	W.O.	71750	✓
4	W.O.	72761	✓
5	W.O.	72760	✓
6	W.O.	72716	✓
7	W.O.	72679	✓
8	W.O.	72678	✓

ITEM: 1 D407-667-105  
 2 D212-664-101  
 3 D212-664-101  
 4 D212-664-101  
 5 D212-664-101  
 6 D212-664-101  
 7 D212-664-101  
 8 D212-664-101

N/O RELEVANT INDICATIONS DETECTED  
 AT THE TIME OF INSPECTION

PT 11-08-17

## Scope of Services

The agreement of Acuren Group Inc. to perform services extends only to those services provided for in writing. Under no circumstances shall such services extend beyond the performance of the requested services. It is expressly understood that all descriptions, comments and expressions of opinion reflect the opinions or observations of Acuren Group Inc. based on information and assumptions supplied by the owner/operator and are not intended nor can they be construed as representations or warranties. Acuren Group Inc. is not assuming any responsibilities of the owner/operator and the owner/operator retains complete responsibility for the engineering, manufacture, repair and use decisions as a result of the data or other information provided by Acuren Group Inc. In no event shall Acuren Group Inc.'s liability in respect of the services referred to herein exceed the amount paid for such services.

## Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied, is made or intended by Acuren Group Inc.

## SIGNATURES

CLIENT REPRESENTATIVE: <u>Ian Titley</u>	TECHNICIAN (SIGNATURE): <u>Sebastien Dault</u>	DTR #
JAME (PRINT): <u>SEBASTIEN DAULT</u>	CGSB LEVEL <u>II</u> SNT LEVEL _____ CGSB LEVEL _____ SNT LEVEL _____	REPORT REVIEWED BY:
CGSB REG. No. <u>12959</u>	CGSB REG. No. _____	NAME INITIALS